

## REMARKS

The rejections presented in the Office Action dated May 27, 2004 have been considered.

Claims 1-15 remain and are not amended, and new claims 16-30 are added to claim the invention in alternative language.

Claims 1-15 stand rejected under 35 USC §102(b) as being anticipated by the publication, "Optimization of Array Subscript Range Checks" by Asuru (hereinafter Asuru). The rejection is respectfully traversed because the Office Action does not show that all the limitations are taught by Asuru.

The invention of claim 1 is a method for verifying at runtime an invariant property of a data structure of a computer program. The limitations include automatically generating a first code segment that verifies a runtime value of the data structure is consistent with the invariant property in response to an annotation of the data structure that defines the invariant property of the data structure; comparing the runtime value of the data structure with the invariant property during execution of the program via execution of the first code segment; and performing a programmed action if the runtime value is inconsistent with the invariant property. The Office Action mistakenly interprets Asuru as teaching these limitations.

For example, the limitations specifically call out generating code that verifies the runtime value of the data structure relative to the invariant property and in response to the annotation of the data structure that defines the invariant property. Asuru does not teach generating code, nor does Asuru teach that the code is generated from the annotation that defines the invariant property.

Asuru specifically teaches *eliminating* redundant range check instructions (page 109, Abstract; page 109, last line), which those skilled in the art would recognize to be opposite of automatically generating the code that verifies the invariant property. Furthermore, assuming for discussion purposes only that eliminating redundant range checks could be construed as automatically generating code, Asuru's elimination of the redundant checks is not in response to the annotation of a data structure that defines the invariant property. Rather Asuru's method includes the three steps: "(1) identify and eliminate inner loop guards, (2) replace subscript operands of range checks with expressions which yield either the least value (lower bound check) or the greatest value (upper bound check) of the subscript operands, and (3) perform range check optimization." (page 110). It is respectfully submitted that Asuru's

range checks verify run-time compliance with an invariant property, but are not an annotation that defines the invariant property.

The rejections of claims 2-15 are similarly in error. That is, in Asuru the range checking code is present in the program and Asuru seeks to eliminate redundant range checking code. There is no apparent teaching in Asuru that the range checking code is automatically generated from an annotation of a data structure, and the cited teaching does not appear to suggest that there is any annotation from which the code is generated.

The Office Action also alleges that certain limitations are inherent. However, in alleging inherency the Office Action ignores limitations in the claims. For example, in claim 4 the invariant property is a range of instruction addresses, and the method verifies that the runtime value of the data structure is within the range of instruction addresses specified in source code of the computer program. The Office Action explains, “As per claim 1 - inherent step – the range is stored in a variable. All entries in the symbol table have an address.” It is respectfully submitted that the claimed range is of *instruction* addresses, not just any data address, and instruction addresses are not believed to be inherently specified in Asuru’s source code. Therefore, the Office Action does not show that the limitations are inherent in Asuru.

The rejections of the claims based on inherency are also improper because the Office Action does not provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art (MPEP 2112). A citation to supporting art is requested if the allegation of inherency is maintained so that the substance of the alleged inherency may be reasonably reviewed.

As to claim 8, the limitations include storing the invariant property in a symbol table, and the Office Action mistakenly alleges that since variables are stored in a symbol table, an invariant property would be stored in a symbol table. This reasoning, to the extent it is understood, apparently equates a variable to an invariant property. However, those skilled in the art will clearly recognize that a variable is not the same as an invariant property.

From the Free On-Line Dictionary Of Computing (FOLDOC) at <http://foldoc.doc.ic.ac.uk/foldoc/index.html>, an invariant is “a rule, such as the ordering of an ordered list or heap, that applies throughout the life of a data structure or procedure. Each change to the data structure must maintain the correctness of the invariant”, and a variable is “a named memory location in which a program can store intermediate results and from which


it can read it them.” Thus, identifying a variable in a symbol table does not suggest storing an invariant property in a symbol table.

The rejection of claim 15 under 35 USC §102(b) as being anticipated by the article entitled, “Writing an Operating System with Modula-3” by Sirer (hereinafter “Sirer”), or in the alternative under §103(a) as being unpatentable over Sirer in view of Asuru, is respectfully traversed. Asuru does not teach the claim limitation as explained above. Furthermore, no teaching of Sirer is cited that shows generating invariant-checking code in response to the annotation of a data structure, and the alleged motivation for combining the references is conclusory. Therefore, the Office Action does not show anticipation by Sirer nor does the Office Action establish *prima facie* obviousness with the Asuru-Sirer combination.

Withdrawal of the rejections and reconsideration of the claims are respectfully requested in view of the remarks set forth above.

Respectfully submitted,

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